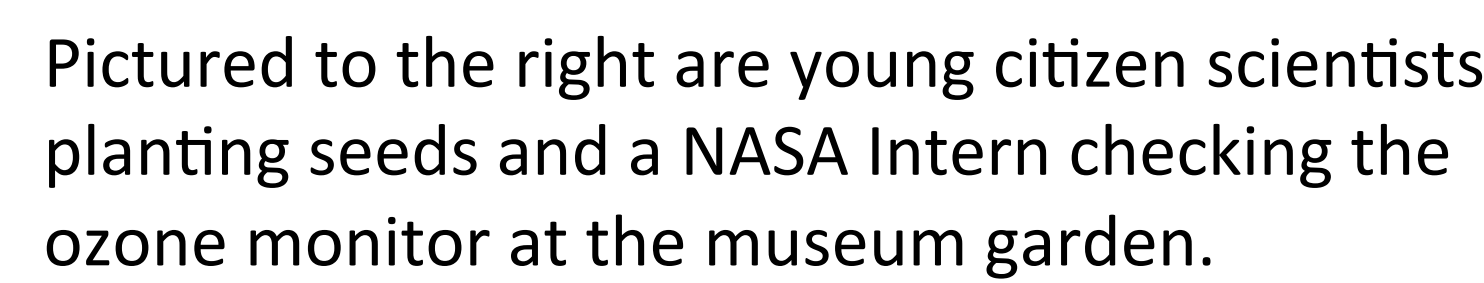
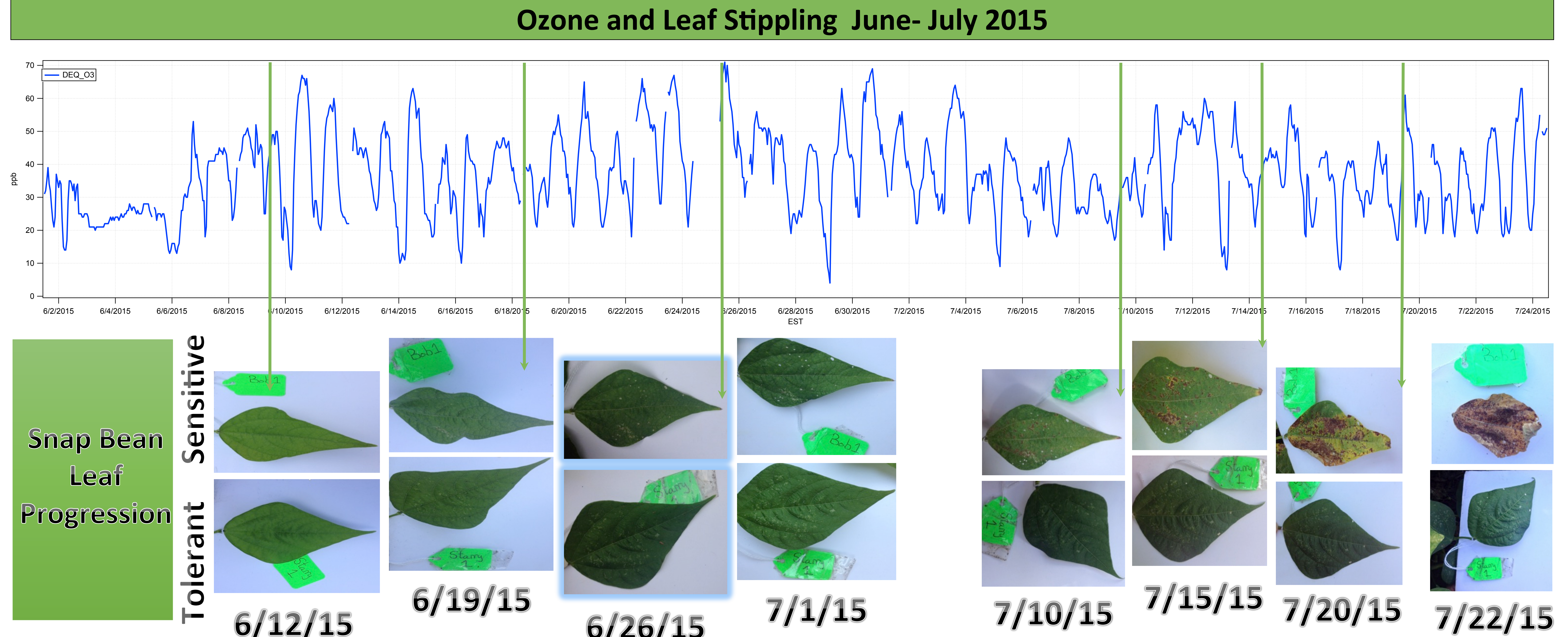


NASA Langley partnered with the Virginia Living Museum and two schools to create ozone bioindicator gardens for citizen scientists of all ages. The garden at the Marshall Learning Center is part of a community vegetable garden designed to teach young children where food comes from and pollution in their area, since most of the children have asthma. The Mt Carmel garden is located at a K-8 school. Different ozone sensitive and ozone tolerant species are growing and being monitored for leaf injury. In addition, CairClip ozone monitors were placed in the gardens and data are compared to ozone levels at the NASA Langley Chemistry and Physics Atmospheric Boundary Layer Experiment (CAPABLE) site in Hampton, VA. Leaf observations and plant measurements are made two to three times a week throughout the growing season.



| <u>Agricultural Plants</u>                               | <u>Sensitive</u>  | <u>Tolerant</u> | <u>Ozone Sensitive Native Plants</u> |                            |
|--|-------------------|-----------------|--------------------------------------|----------------------------|
| <i>Solanum tuberosum</i><br><b>Potato</b>                | <i>La Chipper</i> | <i>Superior</i> | <b>Common Milkweed</b>               | <i>Asclepias syriaca</i>   |
| <i>Nicotiana tabacum</i><br><b>Cigar Wrapper Tobacco</b> | <i>Bel-W-3</i>    | <i>Bel-B</i>    | <b>Cutleaf Coneflower</b>            | <i>Rudbeckia laciniata</i> |
| <i>Phaseolus vulgaris</i><br><b>Snap Bean</b>            | <i>S-156</i>      | <i>R-331</i>    | <b>Black Cherry</b>                  | <i>Prunus serotina</i>     |



**Data Collection Sheets designed for Citizen Scientists of all ages visiting the museum**

| Age Range | Color Worksheet |
|-----------|-----------------|
| 1-3       | Green           |
| 3-5       | Yellow          |
| 6-8       | Orange          |
| 9-10      | Red             |
| 11-13     | Purple          |
| +13       | Brown           |

### Worksheet 1

## Measuring with Blocks

How many blocks tall is this plant?

Plot 1 (plant in garden)

1. What is today's date?

2. How many leaves did this plant have when it was first planted?

3. How many blocks tall is this plant?

4. How many blocks tall is this plant?

5. What is the second plant's ID number?

6. How many blocks tall is this plant?

7. What is the third plant's ID number?

8. How many blocks tall is this plant?

### Worksheet 2

## What's in the Garden?

Find out what plants are in the garden

Plot 1 (plant in garden)

1. What is today's date?

2. How many different types of plants were in the garden?

3. How many leaves did this plant have when it was first planted?

4. How many blocks tall is this plant?

5. What is the second plant's ID number?

6. How many blocks tall is this plant?

7. What is the third plant's ID number?

8. How many blocks tall is this plant?

### Worksheet 3

## Taking Measurements

Learning to take measurements

Plot 1 (plant in garden)

1. What is today's date?

2. How many leaves did this plant have when it was first planted?

3. How many blocks tall is this plant?

4. How many blocks tall is this plant?

5. What is the second plant's ID number?

6. How many blocks tall is this plant?

7. What is the third plant's ID number?

8. How many blocks tall is this plant?

### Worksheet 4

## Ozone in the Garden

Determining signs of ozone injury on plants

Plot 1 (plant in garden)

1. What is today's date?

2. How many leaves did this plant have when it was first planted?

3. How many blocks tall is this plant?

4. How many blocks tall is this plant?

5. What is the second plant's ID number?

6. How many blocks tall is this plant?

7. What is the third plant's ID number?

8. How many blocks tall is this plant?

### Worksheet 5

## Ozone and Leaves

Determining signs of ozone injury on leaves

Plot 1 (plant in garden)

1. What is today's date?

2. How many leaves did this plant have when it was first planted?

3. How many blocks tall is this plant?

4. How many blocks tall is this plant?

5. What is the second plant's ID number?

6. How many blocks tall is this plant?

7. What is the third plant's ID number?

8. How many blocks tall is this plant?

### Worksheet 6

## Type of Injury

Determining the type of injury found in the garden

Plot 1 (plant in garden)

1. What is today's date?

2. How many leaves did this plant have when it was first planted?

3. How many blocks tall is this plant?

4. How many blocks tall is this plant?

5. What is the second plant's ID number?

6. How many blocks tall is this plant?

7. What is the third plant's ID number?

8. How many blocks tall is this plant?

### Worksheet 7

## A Look At Stippling

What is the severity of ozone injury on the affected leaves?

Plot 1 (plant in garden)

1. What is today's date?

2. How many leaves did this plant have when it was first planted?

3. How many blocks tall is this plant?

4. How many blocks tall is this plant?

5. What is the second plant's ID number?

6. How many blocks tall is this plant?

7. What is the third plant's ID number?

8. How many blocks tall is this plant?

### Worksheet 8

## A Look At Stippling

What is the severity of ozone injury on the affected leaves?

Plot 1 (plant in garden)

1. What is today's date?

2. How many leaves did this plant have when it was first planted?

3. How many blocks tall is this plant?

4. How many blocks tall is this plant?

5. What is the second plant's ID number?

6. How many blocks tall is this plant?

7. What is the third plant's ID number?

8. How many blocks tall is this plant?